SUMMARY OF FIRE PROTECTION PROGRAMS FOR CALENDAR YEAR 2002

UNITED STATES DEPARTMENT OF ENERGY
OFFICE OF NUCLEAR AND FACILITY SAFETY POLICY (EH-5)
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FOREWORD

This edition of the Annual Fire Protection Program Summary for the Department of Energy (DOE) continues the series started in 1972.

Since May 1950, an Annual Fire Protection Program Summary (Annual Summary) has been submitted by DOE's fire protection community under the requirements of DOE's predecessor agencies: the Atomic Energy Commission (AEC) and the Energy Research Development Administration (ERDA). This report is currently required by section 5a.(8) of DOE Order 231.1, "Environment, Safety and Health Reporting", which replaced DOE 5484.1, "Environmental Protection, Safety and Health Protection Information Reporting Requirements".

Accident reports required by DOE Order 231.1 are compiled by the Computerized Accident Incident Reporting System (CAIRS) and come from different Field Organization sources then those submitting the Annual Summary. Each quarter, CAIRS issues the Occupational Injury and Property Damage Summary which statistically reports DOE loss topics such as fatalities, injuries, illnesses, fire, and non-fire losses. The Annual Summary validates this process and takes a more comprehensive look at the DOE fire protection program. Fire loss descriptions and statistics are provided, as are reports on a broad range of fire protection activities including; automatic suppression system performance, fire department responses, and the recurring cost of fire protection at DOE sites.

The report for calendar year (CY) 2002 was summarized from information sent to Headquarters by 36 out of 59 reporting elements, representing approximately 79 percent of DOE's ownership. For comparison purposes, field offices are arranged according to the CAIRS reporting format, with a total of 21 categories represented. Abbreviations are identified in the Glossary, as are the DOE site reporting elements and major definitions.

In 1999, the Annual Summary reporting process was automated to streamline data collection and provide a more comprehensive look at reporting element activities. It is now possible to view all responses since 1991 at the Site, Operations, Lead Program Secretarial Office and Headquarters levels. Additionally, a built-in reference to other DOE reporting activities (CAIRS and ORPS) is provided, allowing reporting elements and DOE managers the opportunity to easily review all fire protection events and activities under their responsibility. For example, the information contained in this publication was extracted from the Annual Summary Application (ASA) taken at the Headquarters level for CY 2002. To obtain a copy of the ASA please contact Jim Bisker in the Office of Nuclear and Facility Safety Policy (EH 2-2) at 301.903.6542 or jim.Bisker@hq.doe.gov.

GLOSSARY

Field Organization abbreviations:

AL	Albuquerque Operations
CAO	Carlsbad Area Office
CH	Chicago Operations
FETC	Federal Energy Technology Centers
GFO	Golden Field Office
HQ	Headquarters (DOE)
ID	Idaho Operations
NPR	Naval Petroleum Reserves
NV	Nevada Operations
OK	Oakland Operations (California)
OFO	Ohio Field Office
ORO	Oak Ridge Operations
ORP	Office of River Protection
PA	Power Administrations[1]
PNR	Pittsburgh Naval Reactors Office
RF	Rocky Flats Operations
RL	Richland Operations
SNR	Schenectady Naval Reactors Office
SPR	Strategic Petroleum Reserves[2]
SRO	Savannah River Operations
YM	Yucca Mountain Site Characterization Project Office

Site abbreviations:

ALA	Ames Laboratory
ANLW	Argonne National Laboratory, West
ANLE	Argonne National Laboratory, East
AEMP	Ashtabula Environmental Management Project
BAPL	Bettis Atomic Power Laboratory
BNL	Brookhaven National Laboratory
ETTP	East Tennessee Technology Park
EML	Environmental Measurements Laboratory
FNAL	Fermi National Accelerator Laboratory
FEMP	Fernald Environmental Management Project
GJO	Grand Junction
HAN	Hanford Site[3]
INEEL	Idaho National Engineering & Environmental Laboratory

1. Power Administration organizations are comprised of: the Alaska Power Administration (APA); the Bonneville Power Administration (BPA); Southeastern Power Administration (SEPA), Southwestern Power Administration (SWPA); and the Western Area Power Administration (WAPA).

2 Strategic Petroleum Reserve Sites include: Bayou Chochtaw, Big Hill,Bryan Mound and West Hackberry.

3 Hanford Site includes the Pacific Northwest National Laboratory

ITRI	Inhalation Toxicology Research Institute
KAPL	Knolls Atomic Power Laboratory
KCP	Kansas City Plant
KSO	Kesserling Site
LBL	Lawrence Berkeley National Laboratory
LLNL	Lawrence Livermore National Laboratories
LANL	Los Alamos National Laboratories
MEMP	Miamisburg Environmental Management Project
MGN	Morgantown Federal Energy Technology Center
NREL	National Renewable Energy Laboratory[4]
NRF	Naval Reactor Facilities
NTS	Nevada Test Site[5]
NBL	New Brunswick Laboratory
ORISE	Oak Ridge-Institute of Science & Education
ORNL	Oak Ridge National Laboratories
PAN	Pantex Site
PGDP	Paducah Gaseous Diffusion Plant[6]
PNL	Pacific Northwest Laboratory
PGH	Pittsburgh Federal Energy Technology Center
POR	Portsmouth Gaseous Diffusion Plant[6]
PPPL	Princeton Plasma Physics Laboratory
ROSS	Ross Aviation, Inc.
SLAC	Stanford Linear Accelerator Center
SNLA	Sandia National Laboratories, Albuquerque
SNLL	Sandia National Laboratories, Livermore
SRS	Savannah River Site
TJNL	Thomas Jefferson National Accelerator Facility
WIPP	Waste Isolation Pilot Plant
WSS	Weldon Spring Site
WVDP	West Valley Demonstration Project
WS	Windsor Site
Y-12	Y-12 Plant
YM	Yucca Mountain Project

The below reference is used throughout the report to identify various DOE elements:

DOE field organization (abr.)/Site(abr.)
Example: AL/LANL

DEFINITIONS

[4] National Renewable Energy Laboratory includes the Wind Site

[5] Nevada Test Site Includes: Amador Valley Operations, Las Vegas Operations, Nevada-Los Alamos Operations, Nevada-Special Technology Laboratory, Washington Aerial Measurements Operation, and Nevada-EG&G Wolburn NV.

[6] On July 1, 1993, a lease agreement took effect between the DOE and the United States Enrichment Corporation (USEC) essentially transferring all ownership responsibilities to USEC.

The following terms are defined in the text of DOE Manual M 231.1-1, "Environment, Safety, and Health Reporting Manual." Major definitions not included in this manual have been extracted from the rescinded order DOE 5484.1 to clarify key concepts. Section references to these documents are given at the end of the definition.

1. **Property Value:** The approximate replacement value of all DOE-owned buildings and equipment. Included are the cost of all DOE-owned supplies and average inventory of all source and special nuclear materials. Excluded are the cost of land, land improvements (such as sidewalks or roads), and below ground facilities not susceptible to damage by fire or explosion (such as major water mains and ponds). (APPENDIX C, DOE M 231.1)

2. **Estimated Loss:** Monetary loss determination based on all estimated or actual costs to restore DOE property and equipment to preoccurrence conditions irrespective of whether this is in fact performed. The estimate includes: (1) any necessary nuclear decontamination; (2) restoration in areas that received water or smoke damage, (3) any reductions for salvage value, and (4) any lost revenue experienced as a result of the accident. The estimate excludes: (1) down time; and (2) any outside agency payments. Losses sustained on private property is not reportable, even if DOE is liable for damage and loss consequences resulting from the occurrence. Categorization of occurrences shall be by fire loss and non-fire loss events. (APPENDIX C, DOE M 231.1)

3. **Fire Loss:** All damage or loss sustained as a consequence of (and following the outbreak of) fire shall be classified as a fire loss. Exceptions are as follows: (1) burnout of electric motors and other electrical equipment through overheating from electrical causes shall be considered a fire loss only if self-sustained combustion exists after power is shut off. (APPENDIX C, DOE M 231.1)

4. **Non-fire Loss:** All damage or loss sustained as a consequence of the following events: (1) explosions; (2) natural cause events (such as earthquakes and hurricanes); (3) electrical malfunctions; (4) transportation (cargo) losses; (5) mechanical malfunctions; (6) radiation releases or other nuclear accidents; and (7) miscellaneous accidents (such as thermal, chemical or corrosion-related accidents). (CHAPTER 4.2.c, DOE 5484.1)

5. **Loss Rate:** Unit of comparison in cents loss per $100 of property value.

EXECUTIVE SUMMARY

DOE experienced no fatalities or major injuries from fire in CY 2002. There were however, 107 fire events reported during the period causing an estimated $1,533,674 in property damage. These losses are approximately $1,246,400 more than fire losses sustained in CY 2001, with 89 percent attributed to 5 incidents.

Loss comparisons between the DOE and private industry are performed by normalizing data against total property value. In CY 2002 CAIRS reported a decrease in total DOE property valuation from the previous year by about 4.3 percent (98.8 Billion dollars). The CY 2002 fire loss rate is therefore approximately 0.16 cents for each $100 in property value. This rate is 1.88 cents lower than the five year DOE average, and 0.48 cents lower than insurance industry (non-nuclear) statistics.

Recurring costs for fire protection exceeded 138 million dollars in CY 2002. On a ratio of cost to total property value, the DOE spent approximately 14.04 cents per $100 in property value for recurring fire protection activities or, 0.65 cents more then the previous year.

In CY 2002, five fires were controlled by automatic fire suppression systems. The success of these systems were, however, offset by the inadvertent actuation of 29 systems primarily due to design or mechanical causes (16 events). Additionally, inadvertent Halon discharges (7 events), caused the release of approximately 3,048 pounds of agent into the environment. DOE remains committed to minimizing this ozone depleting substance through implementation of its managed Halon phase out guidelines.

DOE PROPERTY LOSS EXPERIENCE

Property value estimates are taken from the CAIRS database and serve as a common denominator for comparing Annual Summary loss rates to the CAIRS Summary. CAIRS data shows that DOE property values decreased approximately 4.3 percent in CY 2002.

In all, 107 fire incidents were reported by field organizations accounting for a total year-end fire loss of $1,533,674. These events are categorized as follows:

Fire/Smoke (Building) – 49 Events
Fire/Smoke (Brush) – 30 Events
Fire/Smoke (Vehicle) – 11 Events
Fire/Smoke (Other) – 17 Events

Additionally, 91 of the above fires were below the CAIRS reporting threshold of $5,000. Field organizations reported through CAIRS, non-fire loss amounts totaling $920,673 from 17 events.

DOE's fire loss rate for CY 2000, as summarized from field organization reports, is approximately 0.16 cents loss per $100 property value; 533 percent higher then last year's 0.03 cent figure. This current statistic is also about 13 times lower then the 1997-2001 DOE average of 2.04[7], continuing the downward

[7] Eliminating the CY 2000 Cerra Grande from the dataset would yield a 5 year loss rate average of 0.0865.

trend in fire loss rate over the previous year. By comparison, the loss rate average for the highly protected risk (HPR) insurance industry was about 0.64 cents per $100 value[8].

Table 1 characterizes Annual Summary loss histories since 1950 and includes both fire and non-fire loss rate categories. Numbers shown in parentheses represent a 5-year running average, where applicable. The accompanying figures are described as follows:

Figure 1 - graphical representation of the Department's property valuation since 1950
Figure 2 - fire and non-fire property loss since 1981
Figure 3 - fire loss rates since 1986
Figure 4 - non-fire loss rates over the same time period
Figure 5 - the current year's fire event tally by Field Organizations
Figure 6 - the current year's fire loss (dollars) by Field Organizations
Figure 7 - the current year's fire loss rate by Field Organizations
Figure 8 - the current year's non-fire event tally by Field Organizations
Figure 9 - the current year's non-fire loss (dollars) by Field Organizations
Figure 10 - the current year's non-fire loss rate by Field Organizations

Organizations not shown on Figures 5 through 10 reported either insignificant or zero losses for the year.

Trending of fire loss data indicates that a small number of incidents constitute the majority of dollar losses reported to the DOE. For example, 5 fire incidents this year accounted for approximately 89 percent of the total dollar loss amount.

The largest fire and non-fire losses for the year are noted below:

1. NV/ NTS – Wildland fire of 330 acres. CY 02 Damage estimate - $992,000. CAIRS No.: Not Available.

2. SRO/SRS – On 2/2/02, one of the portable diesel generators was obtained from Yard E of the 731-N building to be used as a replacement for an inoperable stationary generator. On 3/21/02, while inspecting the generator during pre-operational checks and to bring the generators to operating standards, approximately 14 gallons of water came out of the crankcase. It was determined that over a period of many years, water had entered the exhaust systems and other open ports, causing significant damage to internal parts of the engine and turbo chargers. It was also determined that the generators did not receive preventative maintenance, periodic inspections or ownership care. CY 02 Damage estimate - $358,000. CAIRS No.: 2001061

The 2002 fourth quarter CAIRS report identified 1 fire incidents over the year resulting in a loss of $27,406; approximately $1,513,000 less than the Annual Summary. Most of this difference, can be traced to 14 incidents which were not incorporated into the CAIRS database. The CAIRS report also lists 17 non-fire incidents producing losses of $920,673. ORPS identifies a total of 37 fire events over CY 2002 in which fire exceeded the minimum 10- minute reporting threshold or met some other ORPS reporting criteria.

8. As reported by an HPR insurance company for standard business property loss from fires and explosions (1997).

This report has historically identified discrepancies between Annual Summary field reports and that of either CAIRS or ORPS databases. In many instances, these discrepancies were traced to either: reporting threshold differences, delayed reporting, cost estimating differences, improper loss characterization, or a misinterpretation on the need to file a report at all. Since loss statistics from CAIRS and ORPS are often extracted for use in other documents such as reports to Congress, performance indicator studies, and media releases, an incomplete reflection of DOE fire loss history is often the result. Database administrators are addressing these issues by increased field training programs and by streamlining the reporting process using state of the art electronic technology. A part of this technology includes developing a "seamless" approach using a library of definitions that allows the sharing of data across multiple database applications.

RECENT DEVELOPMENTS: In 2003, DOE senior management made the decision to consolidate both CAIRS and ORPS requirements into a single EH reporting Order: DOE O 231.1A, **ENVIRONMENT, SAFETY, AND HEALTH REPORTING.** Specific CAIRS reporting fields are described by DOE Manual 231.1-1A, "Environment, Safety and Health Reporting," and ORPS reporting fields described by DOE Manual 231.1-2, "Occurrence Reporting and Processing of Operations Information." Major revisions to DOE M 231.1-1A include eliminating property loss and site valuation reporting. This loss will impact the Annual Fire Protection Summary and its reporting application in a significant way. For example, CAIRS property values, used to compute fire loss rates, will need to be derived from other sources and may be less then the previous valuation method. If this is the case, then sites could experience an increased fire loss rate without an appreciable increase in the fire loss amount. Additionally, the Annual Fire Protection Summary will lose the comparison between fire and non-fire events and the reporting application will have to be rewritten to accommodate the other valuation sources. If approved, this revision will take effect in the calendar year 2003 Summary.

Table 1

DOE Loss History From 1950 To Present

Year	Property Value (Millions of Dollars)	Fire Loss (Dollars)	Non-fire Loss (Dollars)	Loss Rates (cents per 100 Dollar Value) Fire*	Non-Fire*	Total*
50	1,800.00	486,389	10,050	2.70 -	0.06 -	2.76 -
51	2,177.10	38,318	317,797	0.18 -	1.46 -	1.64 -
52	3,055.10	449,107	356,600	1.47 -	1.17 -	2.64 -
53	4,081.00	148,142	427,430	0.36 -	1.05 -	1.41 -
54	6,095.90	185,438	190,436	0.30 -	0.31 -	0.62 -
55	6,954.20	125,685	330,103	0.18 (1.00)	0.47 (0.81)	0.66 (1.81)
56	7,364.10	2,206,478	940,945	3.00 (0.50)	1.28 (0.89)	4.27 (1.39)
57	7,973.20	590,663	885,936	0.74 (1.06)	1.11 (0.86)	1.85 (1.92)
58	8,102.50	275,560	476,265	0.34 (0.92)	0.59 (0.84)	0.93 (1.76)
59	10,301.80	199,841	998,060	0.19 (0.91)	0.97 (0.75)	1.16 (1.67)
60	10,708.60	636,228	764,823	0.59 (0.89)	0.71 (0.88)	1.31 (1.77)
61	11,929.90	325,489	5,530,566	0.27 (0.97)	4.64 (0.93)	4.91 (1.91)
62	12,108.80	3,020,023	293,341	2.49 (0.43)	0.24 (1.60)	2.74 (2.03)
63	13,288.90	599,056	776,998	0.45 (0.78)	0.58 (1.43)	1.04 (2.21)
64	14,582.80	480,519	870,516	0.33 (0.80)	0.60 (1.43)	0.93 (2.23)
65	15,679.30	1,743,448	2,106,621	1.11 (0.83)	1.34 (1.35)	2.46 (2.18)
66	16,669.00	158,220	698,753	0.09 (0.93)	0.42 (1.48)	0.51 (2.41)
67	17,450.90	359,584	2,423,350	0.21 (0.90)	1.39 (0.64)	1.59 (1.53)
68	18,611.90	155,986	713,097	0.08 (0.44)	0.38 (0.87)	0.47 (1.31)
69	20,068.30	27,144,809	909,525	13.53 (0.37)	0.45 (0.83)	13.98 (1.19)
70	22,004.30	89,456	1,611,336	0.04 (3.00)	0.73 (0.80)	0.77 (3.80)
71	24,155.80	78,483	1,857,566	0.03 (2.79)	0.77 (0.68)	0.80 (3.47)
72	26,383.50	222,590	698,061	0.08 (2.78)	0.26 (0.75)	0.35 (3.52)
73	27,166.70	117,447	2,258,241	0.04 (2.75)	0.83 (0.52)	0.87 (3.27)
74	28,255.50	249,111	930,766	0.09 (2.75)	0.33 (0.61)	0.42 (3.36)
75	31,658.30	766,868	4,485,481	0.24 (0.06)	1.42 (0.59)	1.66 (0.64)
76	35,512.70	251,849	2,040,727	0.07 (0.10)	0.57 (0.72)	0.65 (0.82)
77	39,856.10	1,084,823	2,529,161	0.27 (0.11)	0.63 (0.68)	0.91 (0.79)
78	47,027.10	12,976,036	4,501,943	2.76 (0.14)	0.96 (0.76)	3.72 (0.90)
79	50,340.80	654,716	1,886,307	0.13 (0.69)	0.37 (0.78)	0.50 (1.47)
80	54,654.70	1,385,686	7,160,249	0.25 (0.69)	1.31 (0.79)	1.56 (1.49)
81	59,988.80	2,042,633	2,600,855	0.34 (0.70)	0.43 (0.77)	0.77 (1.47)
82	65,360.40	948,691	3,252,277	0.15 (0.75)	0.50 (0.74)	0.64 (1.49)
83	70,484.40	731,234	9,765,828	0.10 (0.73)	1.39 (0.71)	1.49 (1.44)
84	82,166.90	1,549,807	4,917,513	0.19 (0.19)	0.60 (0.80)	0.79 (0.99)
85	86,321.84	1,145,975	2,983,322	0.13 (0.21)	0.35 (0.85)	0.48 (1.05)
86	82,787.52	805,030	4,490,262	0.10 (0.18)	0.54 (0.65)	0.64 (0.83)
87	91,927.20	1,570,736	1,440,093	0.17 (0.13)	0.16 (0.67)	0.33 (0.81)
88	92,998.00	466,120	7,837,000	0.05 (0.14)	0.84 (0.61)	0.89 (0.74)
89	107,948.00	615,551	6,890,000	0.06 (0.13)	0.64 (0.50)	0.70 (0.63)
90	115,076.00	8,392,746	9,078,000	0.73 (0.10)	0.79 (0.51)	1.52 (0.61)
91	118,868.68	608,740	1,820,065	0.05 (0.22)	0.15 (0.59)	0.20 (0.81)
92	118,267.06	1,166,858	2,486,696	0.10 (0.21)	0.21 (0.52)	0.31 (0.73)
93	119,826.25	679,939	2,338,595	0.06 (0.20)	0.19 (0.53)	0.25 (0.73)
94	124,350.29	1,533,717	1,869,933	0.12 (0.20)	0.15 (0.40)	0.27 (0.60)
95	120,321.68	720,720	911,746	0.06 (0.21)	0.08 (0.30)	0.14 (0.51)
96	113,471.00	2,372,482	3,653,350	0.21 (0.08)	0.32 (0.16)	0.53 (0.24)
97	102,947.24	544,924	5,567,963	0.05 (0.11)	0.54 (0.19)	0.59 (0.30)
98	99,127.79	316,475	1,062,313	0.03 (0.10)	0.11 (0.26)	0.14 (0.36)
99	110,858.47	443,049	2,467,991	0.04 (0.10)	0.22 (0.24)	0.26 (0.34)
00	102,514.01	102,861,283	312,839	10.03 (0.08)	0.03 (0.25)	10.06 (0.33)
01	103,215.56	287,263	218323	0.03 (2.07)	0.02 (0.25)	0.05 (2.32)
02	98,779.44	1,541,174.00	920,673	0.16 (2.04)	0.09 (0.19)	0.25 (2.23)

*Numbers shown in parentheses represent the 5-year running average.

Figure 1

DOE Property Valuation

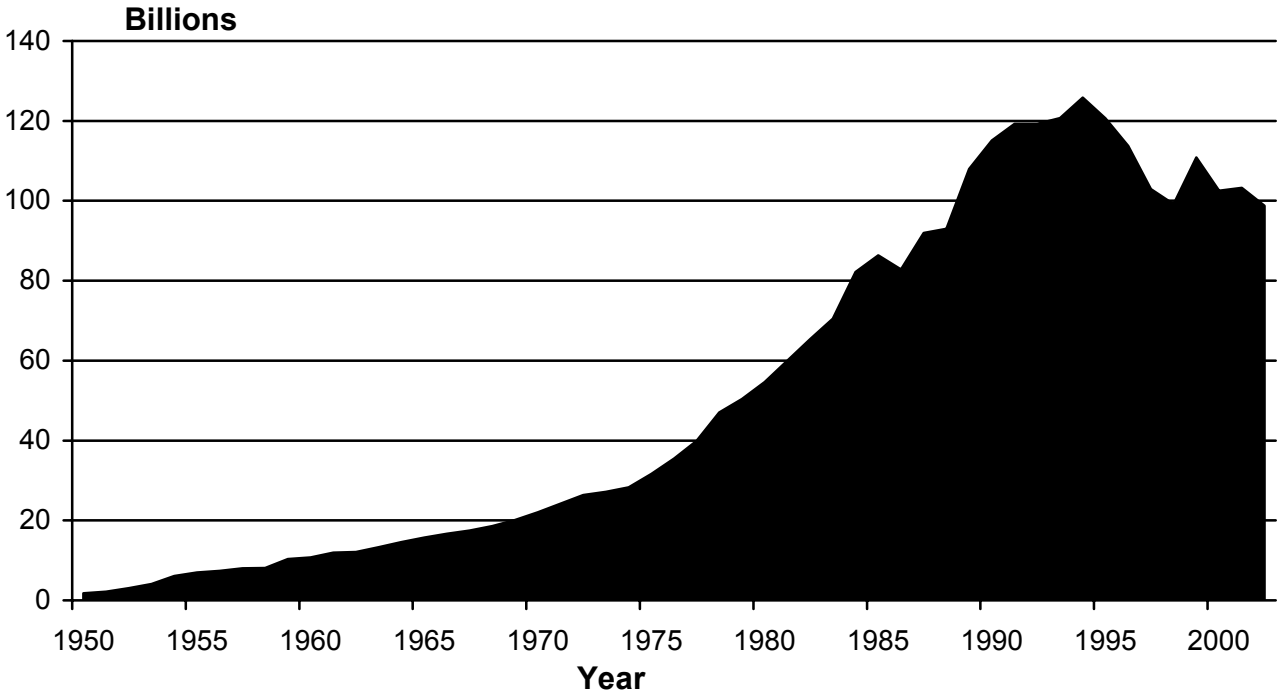


Figure 2

Property Loss

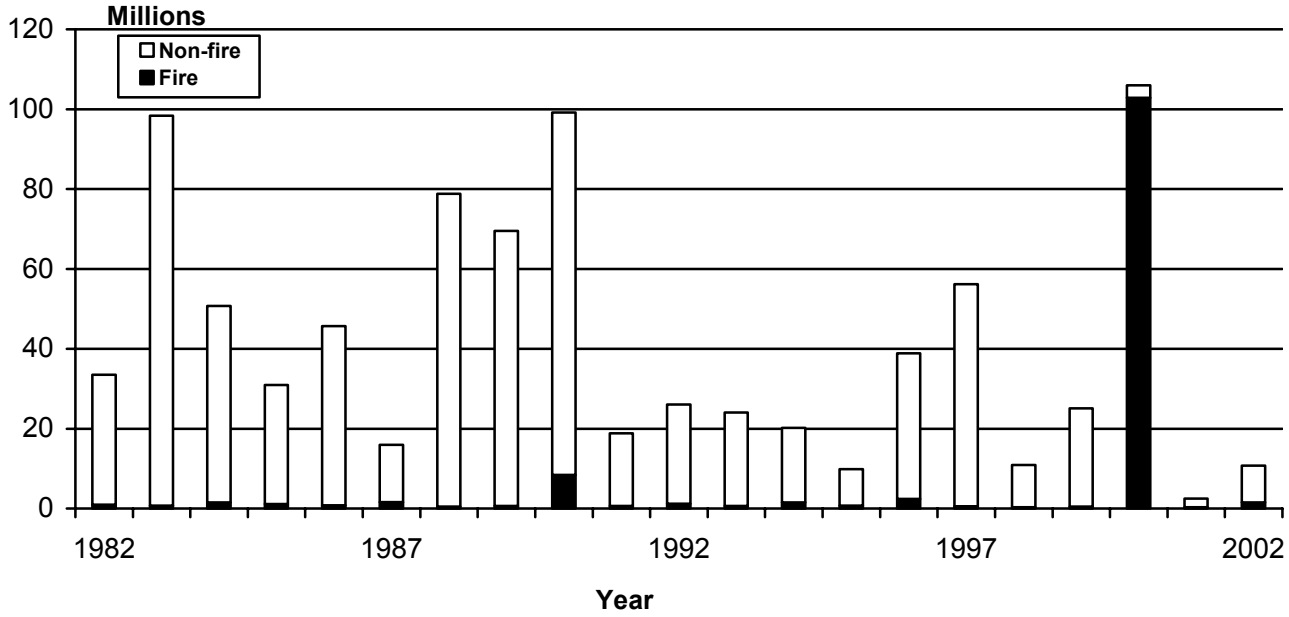


Figure 3

DOE Fire Loss Rate

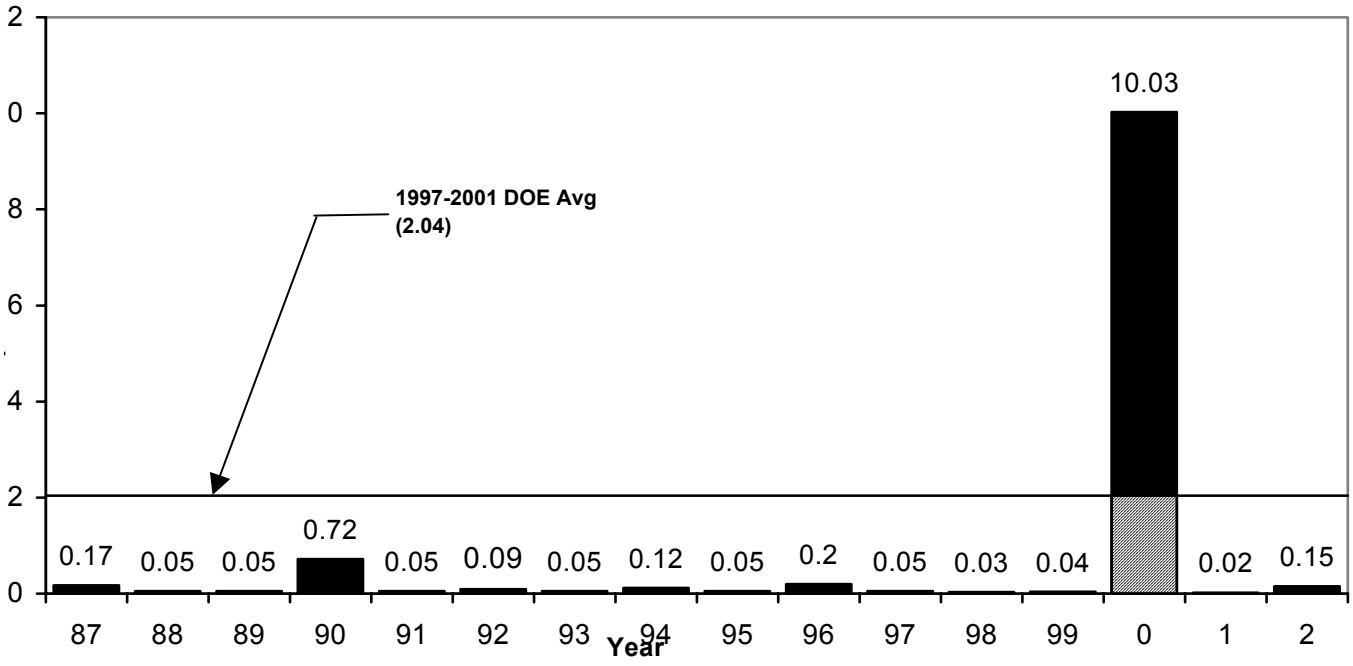


Figure 4

DOE Non-fire Loss Rate

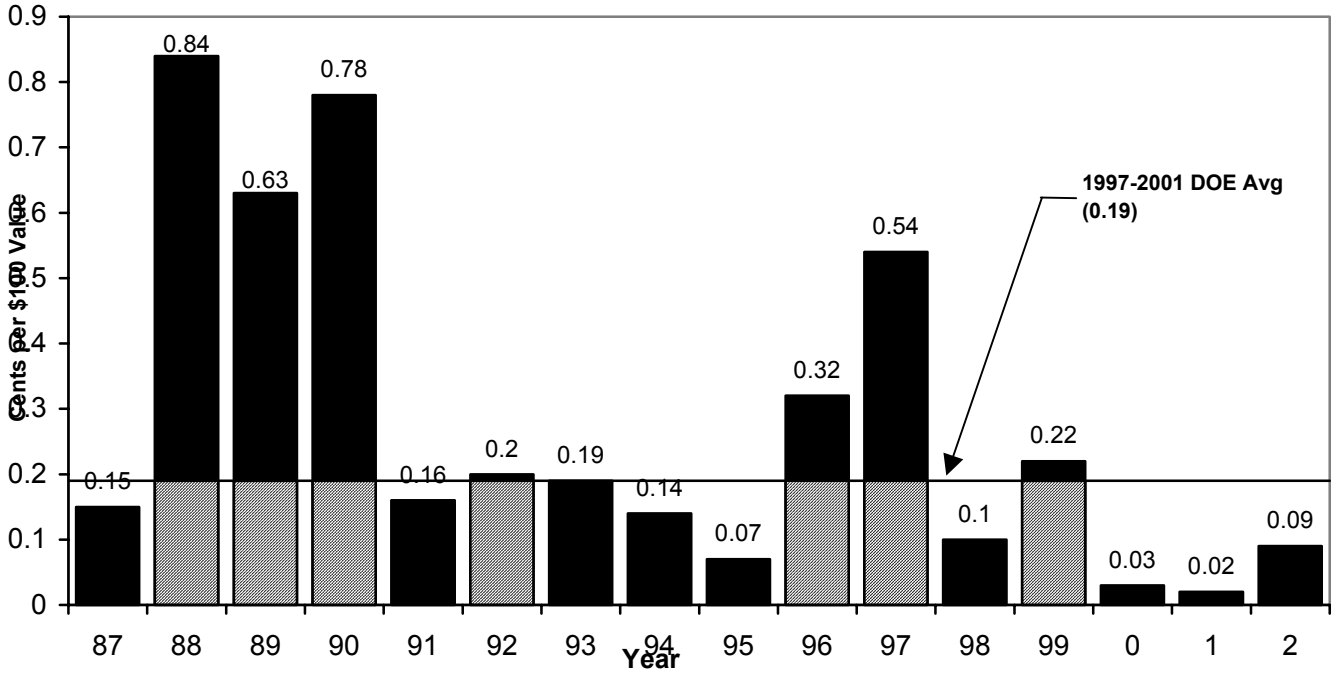


Figure 5

Fire Events by Field Organization

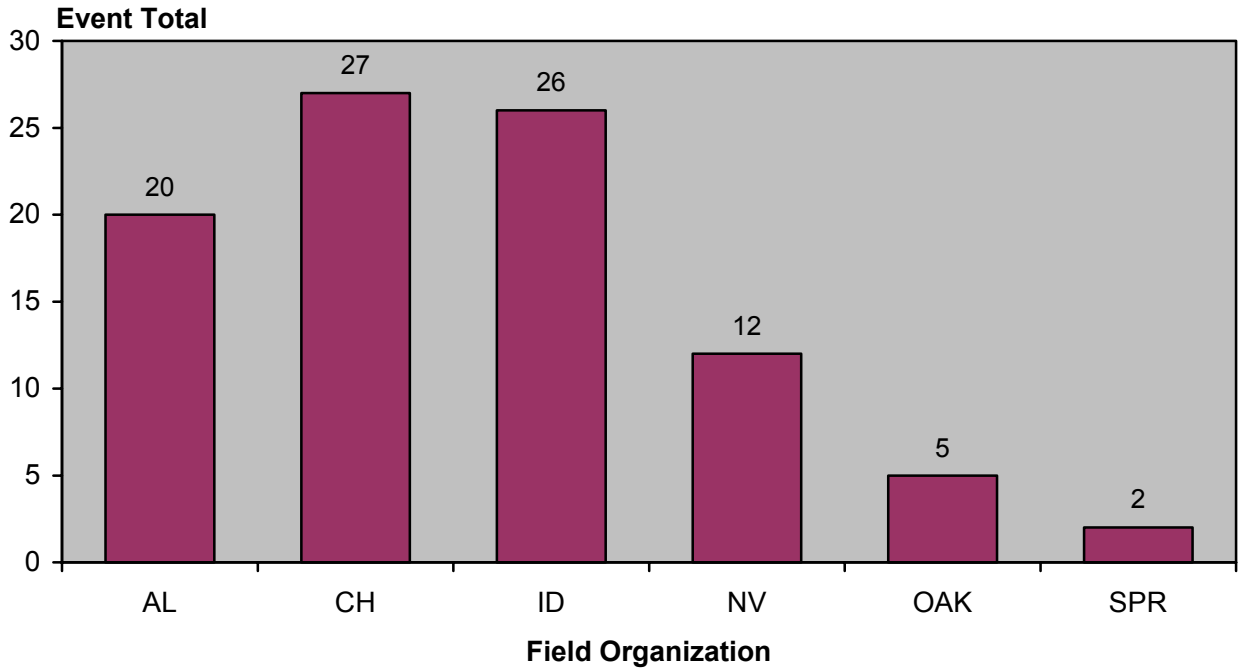


Figure 6

Fire Loss Amount by Field Organization

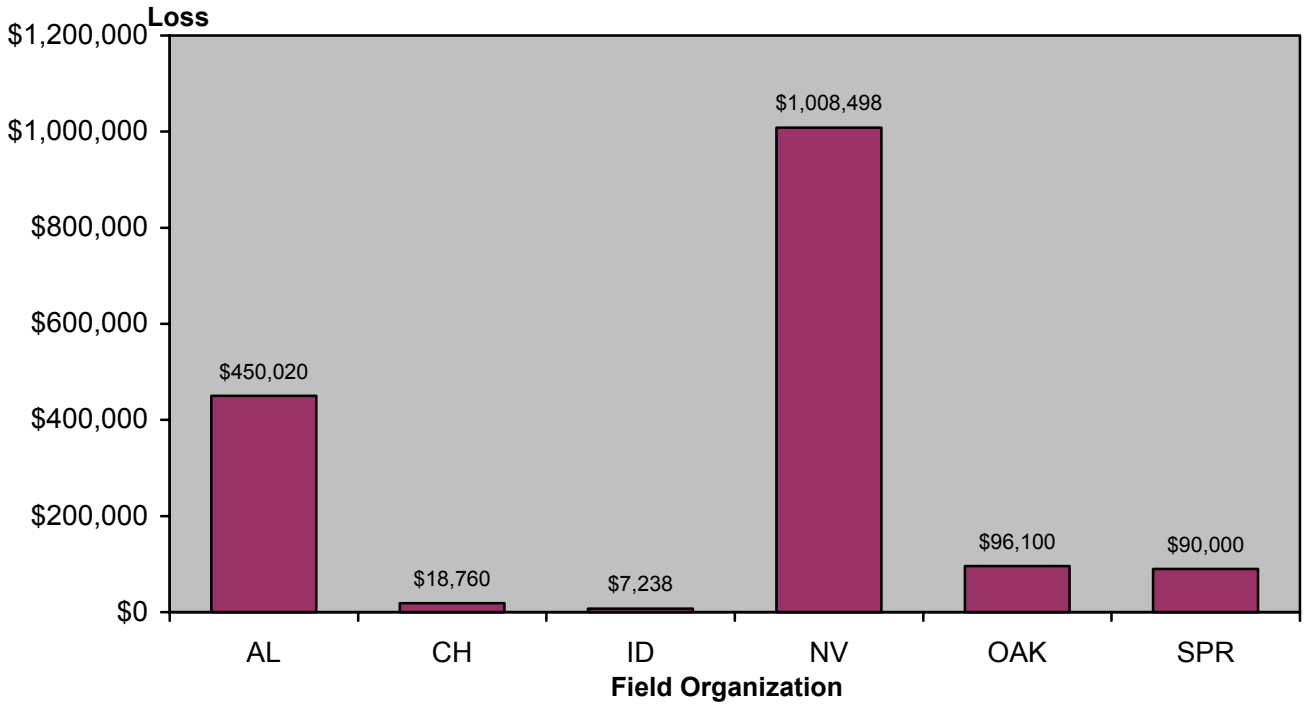


Figure 7

Fire Loss Rate by Field Organization

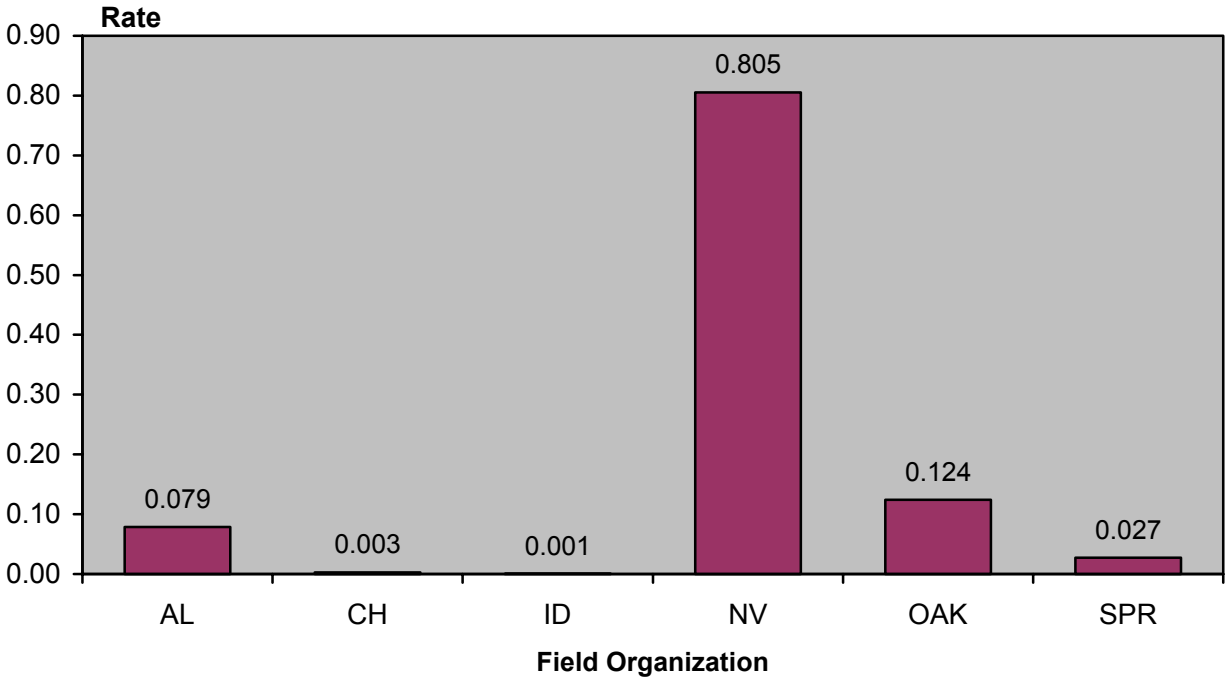


Figure 8

Non-fire Loss Events by Field Organization

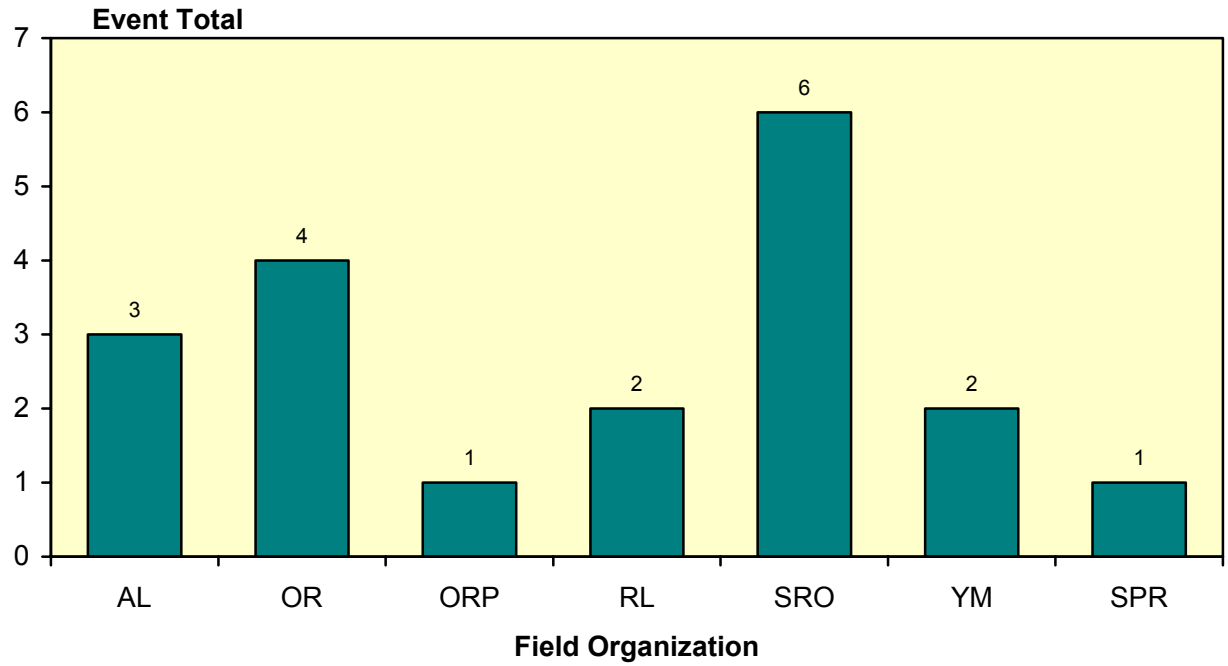


Figure 9

Non-fire Loss Amount by Field Organization

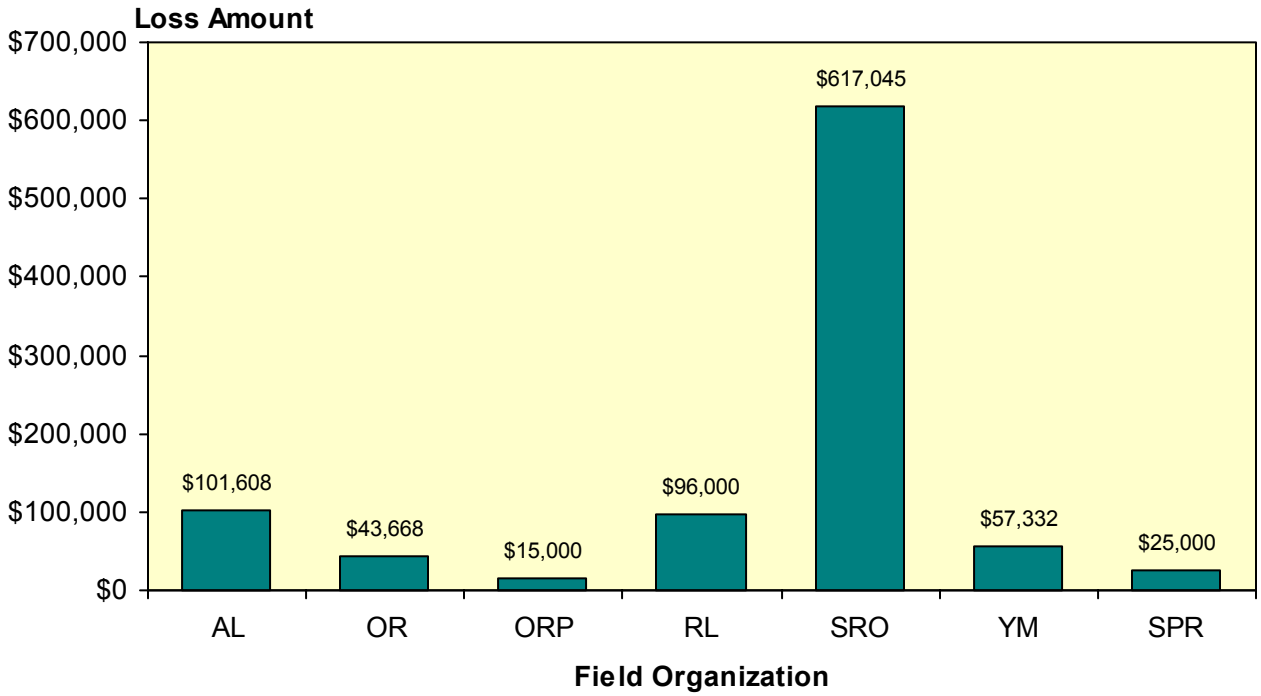
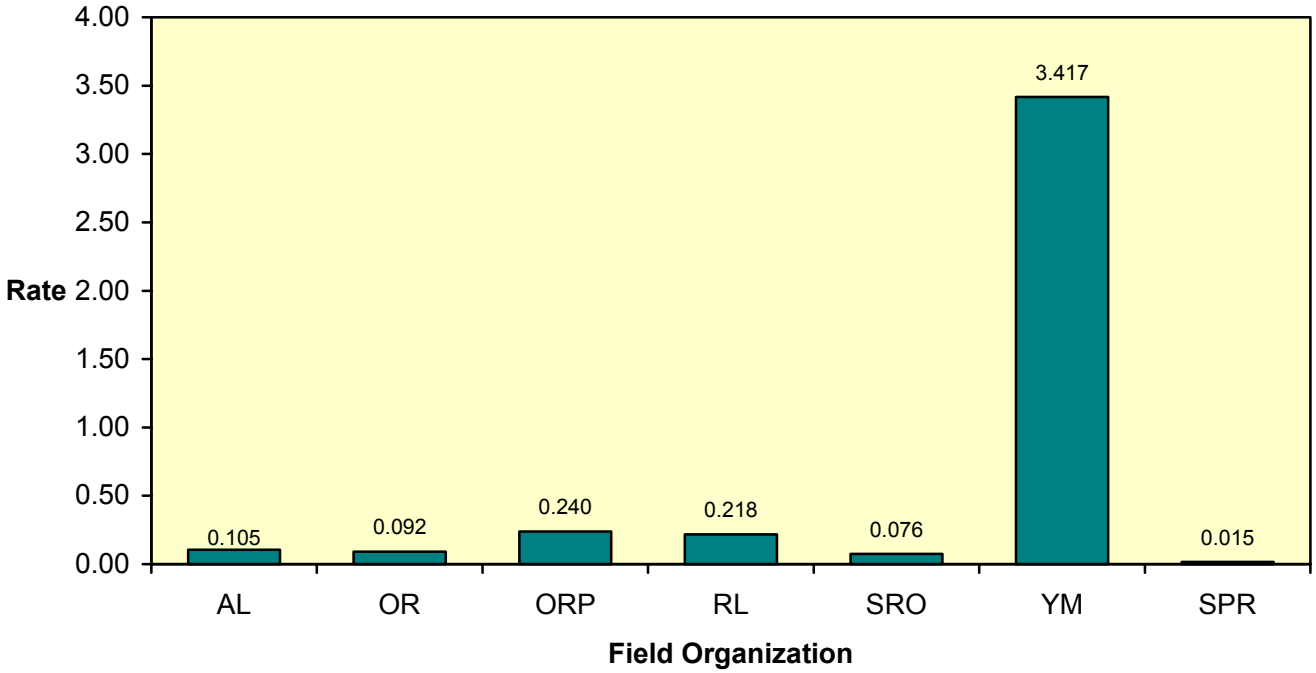


Figure 10

Non-fire Loss Rate by Field Organization



SUMMARY OF FIRE DAMAGE INCIDENTS

The following table provides a description major DOE fire losses over the year. See Tables 3 and 6 for fire events involving fixed automatic fire suppression systems:

Table 2: **Summary of Fire Damage Incidents**

LOSS TYPE	LOCATION	DESCRIPTION	DOLLAR LOSS
Fire/Smoke (Brush)	NV / NTS	Wildland fire of 330 acres	$992,000.00
Fire/Smoke (Building)	AL / PAN	Trailer fire	$198,309.00
Fire/Smoke (Building)	SPR / SPR	Bryan Mound on-duty ERT responded to an on site transformer fire caused by lightning strike to a section of the air terminal on a lightning arrestor tower. The section then fell across the secondary 4160-volt buss and a phase-to-phase fault occurred. Site ERT's extinguished the remaining fire and then remained on scene until power was restored. (Occurrence Report BM-2002-0003)	$90,000.00
Fire/Smoke (Other)	SRO / SRS	At 13:27, SRSFD personnel were dispatched to a call-in alarm for a possible fire at the 105-K substation. Fire fighters responded and upon arrival discovered that an electrical event in the 105-K containment substation blew the door open causing smoke and flame, which were momentarily visible. The fire self extinguished when the breaker at 151-K tripped out. The entire event lasted 30 seconds or less. There were no SRSFD actions on the scene. There were no injuries and the damage estimate is $50,000.	$50,000.00
Fire/Smoke (Building)	OAK / LBL	Cutting torch sparks and slag went through hole in steel decking plate, starting a fire in a subgrade cable trench that contained combustibles.	$45,000.00
Fire/Smoke (Building)	OAK / LLNL	The room (with a floor space of approximately 19 feet by 9 feet) was equipped with six empty process tanks and one in-use process tank used for silver plating. The process tank (made of fiberglass material with polyethylene-liner) in question had been used for silver-plating parts for months since late 2001. In mid-December 2001, the tank operation was terminated, but the tank heater was left on by the operator. The tank solution then evaporated over the following weeks without the knowledge of the facility workers because the tank was located in a remote room. When the tank solution level eventually dropped below the heater, the heater overheated. First the Teflon heater cover ignited, setting the polyethylene-liner on fire and then set the exhaust hood on fire. Subsequently, one of the nearby fire sprinklers on the ceiling was activated. The LLNL Fire Department responded immediately and the fire was extinguished. The cost of repairing the room, excluding replacement of the process tanks and heaters, was estimated to be $40,000.	$40,000.00
Fire/Smoke (Vehicle)	AL / KCP	Honeywell Federal Manufacturing and Technologies Kansas City (FM and T/KC was informed on November 11, 2002, that 40 procured parts were destroyed in an October 29, 2002, transportation accident involving a commercial carrier. The 40 parts were being shipped from Honeywell FM and T/KC to the supplier for additional testing and evaluation for potential application in a new program. The vehicle accident occurred in St. Louis, MO, en route to the supplier in Miamisburg, OH. The 40 each purchased	$27,406.00

Table 2: **Summary of Fire Damage Incidents**			
LOSS TYPE	**LOCATION**	**DESCRIPTION**	**DOLLAR LOSS**
		production parts (actuators were worth a total of $27,506. The commercial carrier informed Honeywell FM and T/KC Accounting that they would reimburse a total of $100 because the government is self-insured. A DOE order restricts Honeywell FM and T from buying insurance for normal shipping operations. Honeywell FM and T/KC took action to immediately support customer requirements for the lost product. 40 actuators were destroyed.	
Fire/Smoke (Building)	NV / NTS	Trailer fire due to an electrical malfunction.	$15,000.00
Fire/Smoke (Building)	OAK / SLAC	Damage to a Modulator Sector 28-8 in the Accelerator gallery.	$10,000.00
Fire/Smoke (Building)	AL / LANL	September 2002, an electrical malfunction in the ATLAS equipment created a flash fire and fire ball actuating 2 sprinklers, damage was estimated at less than $10, 000.	$9,999.00
Fire/Smoke (Building)	SRO / SRS	At 14:00, Dispatch received a call-in request for assistance from 241-28H regarding an electrical problem. Upon arrival, SRSFD personnel discovered that a loss of incoming 13.8kv phase resulting in an excessive load on the balance of the phases had caused minor heat damage to one of the cubicles. The affected MCC was de-energized and the fire self-extinguished. There were no injuries and the dollar loss cost estimate is $7500.	$7,500.00
Fire/Smoke (Other)	CH / FNAL	Electrial Malfunction due to oil seal leak (packing) leaking oil onto hot equipment and electrial panel. Fire run report 02277	$6,000.00
Fire/Smoke (Building)	CH / FNAL	Old wood Portakamp heater failure. Value of portakamp and computer equipment $5000. Fire Dept run # 02305	$5,000.00
Fire/Smoke (Building)	SRO / SRS	At 10:38, SRSFD personnel were dispatched to a call-in fire alarm associated with maintenance work in the 221-F, Hot Crane. The crane was being located to access the crane wheels when an electrical arc ignited associated wiring. A mechanic extinguished the fire using a 10-lb. dry chemical extinguisher and prevented further extension. The damage was confined to wire wrappings and insulation. All power to the crane was de-energized. There were no injuries and the estimated dollar loss value is $4,954.00.	$4,954.00

WATER-BASED AUTOMATIC SUPPRESSION SYSTEM PERFORMANCE

A total of 16 incidents were reported where water-based suppression systems operated in CY 2002: 9 were wet-pipe systems, 3 dry-pipe, 1 deluge, 2 pre-action, and 1 HiX foam system. Of the wet-pipe system activations, three events were directly related to fire. System activations were caused by the following events: employee related (3), design/material related (4), weather related (3), procedure related (2), and unspecified/other related (4).

Water-based system activations of interest are listed in Table 3.

Table 3: **Water Based System Actuations**			
LOSS TYPE	**LOCATION**	**DESCRIPTION**	**DOLLAR LOSS**
Fire/Smoke (Building)	OAK / LLNL	The room (19 feet by 9 feet) was equipped with six empty process tanks and one in-use process tank used for silver plating. The process tank (made of fiberglass material with polyethylene-liner) had been used for silver-plating parts for months since late 2001. In mid-December 2001, the tank operation was terminated, but the tank heater was left on by the operator. The tank solution evaporated over the following weeks without the knowledge of the facility workers because the tank was located in a remote room. When the tank solution level eventually dropped below the heater, the heater overheated. First the Teflon heater cover ignited, setting the polyethylene-liner on fire and then set the exhaust hood on fire. Subsequently, one of the nearby fire sprinklers on the ceiling was activated. The LLNL Fire Department responded and the fire extinguished. Costs include repairing the room, excluding replacement of the process tanks and heaters.	$40,000.00
Leaks, Spills, Releases	ID / INEEL	A tee on the end of a fire sprinkler branch line froze causing the tee to break. Approximately 5000 gallons was discharged in the building causing extensive damage to ceiling tiles, furnature, paper products on both 1st and 2nd floors of the Aannex	$19,000.00
Fire/Smoke (Building)	AL / LANL	September 2002, an electrical malfunction in the ATLAS equipment created a flash fire and fire ball actuating 2 sprinklers.	$9,999.00
Fire/Smoke (Building)	SRO / SRS	At 19:37, SRSFD personnel were dispatched to 773-A for a sprinkler water flow alarm from D-Wing. Upon investigation it was determined that a sprinkler head had activated as a result of a window AC unit that had caught fire. There was a large amount of black smoke present but the sprinkler held the fire in-check and had actually extinguished the fire. The sprinkler was valved off, head replaced, and the sprinkler restored to service. Exhaust fans were used to ventilate the facility and fire fighters assisted with salvage and overhaul operations. The heavily charred area was about 8’ X 8’ in size. There were no injuries.	$500.00
Leaks, Spills, Releases	ID / INEEL	A maintenance person was working on the overhead door in the security garage. When the worker operated the door, it did not stop and eventually broke the 1" drop to two sprinklers located below the door. Approximately 150 gallons of water was discharged causing very little damage.	$466.00
Leaks, Spills, Releases	AL / KCP	Water flow alarm received for CV-49 at BX-26. Fire Department responded to investigate. Cause of this alarm was steam and heat build up in fan room 8B at BQ-26 1/2 due to AHU fan being turned off and the steam coil left on. Fire department closed valve for sprinkler system CV-49. Maintenance was advised to replace all 212-degree sprinkler heads in area of fan room 8B at BQ-26 1/2.	$236.00
Leaks, Spills, Releases	OAK / LLNL	A high expansion foam system was found to be inoperable when it was inadvertently activated. The foam system was found to be clogged, among other things. Most of the piping was dismantled and cleaned. The system was restored to operability.	$0.00

There are a total of 243 incidents in DOE records where water based extinguishing systems operated in a fire. The satisfactory rate of performance is 99.2 percent, or 241 times out of 243 incidents. The two failures during a fire were attributed to; a closed cold weather valve in 1958 controlling a single sprinkler in a wood dust collector and, a deluge system failure due to a hung-up trip weight in a 1963 transformer explosion.

From the above history, DOE has experienced 115 fires that were either controlled or extinguished by the wet-pipe type of automatic suppression system. Table 4 below provides a summary on the number of sprinklers actuated to control or extinguish a fire against the number of occurrences where this event was reported. For example: 95 percent of these fires were controlled or extinguished with 4 or less sprinklers activating, 91 percent were controlled with 3 or less sprinklers activating, and so on.

The significance of this table is to highlight actual performance on systems that have been installed according to standard design practices (in this case the National Fire Protection Association (NFPA) Standard 13, Installation of Sprinkler Systems). By comparing the actual performance to design requirements, the designer or reviewer can get a sense of the conservativeness of the design requirement and adjust the design where necessary. Sprinkler system water containment, for example, could rely on actual performance rather than strict design practice, since no specific design criteria exist on the subject.

Table 4
DOE Wet-Pipe Automatic Suppression Performance
1955 to 2001

Number of Sprinklers Activated per Fire Event	Number of Events	Cumulative Total of Events	Percentage of Event	Cumulative Percentage of Events
1	81	81	70	70
2	19	100	17	87
3	5	105	4	91
4	4	109	3	95
5	2	111	2	97
6	1	112	1	97
7	2	114	2	99
8	0	114	0	99
9+	1	115	1	100

NON WATER-BASED FIRE SUPPRESSION SYSTEM PERFORMANCE

Concerns regarding the effect of chlorinated fluorocarbons (CFCs) and Halon on the ozone layer have led to their regulation under the 1991 Clean Air Act. The Environmental Protection Agency has subsequently published rules on this regulation to include; prohibiting new Halon production, establishing container labeling requirements, imposing Federal procurement restrictions, imposing significant Halon taxes,

issuing requirements for the approval of alternative agents, and listing essential areas where Halon protection is considered acceptable.

DOE's current policy does not allow the installation of any new Halon systems. Field organizations have been requested to aggressively pursue alternative fire suppression agents to replace existing systems and to effectively manage expanding Halon inventories. The long-term goal is the gradual replacement of all Halon systems.

In CY 2002, the DOE had 426 Halon 1301 systems in operation containing approximately 144,948 pounds of agent. Stored Halon 1301 inventory was reported at approximately 89,614 pounds[9]. Operational and stored inventory amounts for the Halon 1211 were reported at 92,516 and 15,425 pounds, respectively. Field organizations reported that 113 non-essential systems were removed from service in 2002, adding approximately 12,858 pounds to DOE's inventory.

Table 5 provides a breakdown of the five largest Halon utilizing field organizations, listing both Halon 1301 (fixed system extinguishing agent) and Halon 1211 (portable extinguishing agent). Agent Drawdown amount represents the Halon released to the environment over the calendar year. The bulk of Halon utilized within the Power Administrations[10] is located at WAPA.

Table 5
Primary DOE Sites Utilizing Halon Suppression Systems

LOCATION	HALON 1301		AGENT DRAWDOWN	HALON 1211	
	ACTIVE (lbs.)	INVENTORY (lbs.)		ACTIVE (lbs.)	INVENTORY (lbs.)
SRO*	31,669	8,751	1494	0	0
AL	31,276	28,302	0	46,254	4,370
CH	34,294	13,717	0	16,454	191
PA	10,828	2,331	0	2,155	0
SPR	8,554	0	1194	0	0
Total	116,621	53,101	2688	64,863	4,561

* Designated as DOE's Halon bank.

Comparing total (active, inventory, and banked amounts) Halon 1301 stores reported in CY 2002 (369,798 pounds) to those reported in CY 2001 (355,911 pounds) indicates that DOE's Halon supply grew by 13,887 pounds. Comparing this difference to the CY 2002 drawdown amount (3,358 pounds) leaves a discrepancy of approximately +17,245 pounds. This discrepancy relates to accounting revisions for the Halon Bank.

[9] Amount excludes banked inventory at the SRS – 87,763 pounds Halon 1301, 0 pounds Halon 1211. SRO reports that all banked Halon 1211 fire extinguishers have been removed and sent to DOD/DLA. Halon 1211 was given, not sold, to DLA. 8,436 pounds of Halon 1301 were recycled and placed in bulk storage tanks. The Halon 1301 bank was defined as 50,000 pounds (25K for SRS and 25K for the remainder for the DOE complex) and the rest is slated to be shipped to the DLA in early 2003.

[10] In CY 1996, BPA ceased reporting any losses according to DOE O 231.1. Last known Halon amounts for the BPA were 14,495 lbs. in 6 systems and are not reflected in the current DOE totals.

Sites considering any Halon transfers outside the DOE are reminded that a Halon bank has been established so that reserve capacity can be maintained for mission essential systems in the complex that have not yet been replaced. The SR Fire Department may be contacted for further information regarding Halon transfers.

A total of 18 incidents were reported at DOE where Halon 1301 or other non-water based suppression systems operated in CY 2002. No sites reported any system failures during a fire. Additionally, approximately 3,358[11] pounds of Halon 1301 were released to the environment. Non Water-based system activations of interest are listed in Table 6 below.

Table 6: **Non Water Based System Actuations**

LOSS TYPE	LOCATION	DESCRIPTION	DOLLAR LOSS
Leaks, Spills, Releases	RL / HAN	A dry chemical system discharged into a glove box when an employee accidentally hit a single-action manual initiating station. Single action manual initiating stations were replaced with double action stations.	$10,000.00
Fire/Smoke (Building)	CH / BNL	An electrical short on a printed circuit card in Bldg 1008 (PHENIX) resulted in the production of smoke. The smoke activated the adjacent Inergen System (uses HSSD spot detection on cross zoning). Fire alarm systems turned off power and no further damage occurred. There was $300 in damage to boards and it cost $1,500 to recharge the Intergen system. Incident Report Number: 020349	$1,800.00
Leaks, Spills, Releases	AL / KCP	Manual discharge of CO2 system 9A at FS-21. Fire Department and maintenance personnel were returning the system to normal after impairing the system for PM. The accidental discharge occurred when the pipe fitter accidentally pulled one of the cable releases while tightening the actuator. No injuries or property damage incurred.	$130.00
Leaks, Spills, Releases	NV / NTS	Inadvertent discharge when the HVAC system, designed to cool a diagnostics-trailer, lost power during a power outage and atmospheric temperatures rose to the heat detector's actuating temperature. No damage to equipment or facility, resulting in a zero dollar loss (two events).	$0.00
Leaks, Spills, Releases	SRO / SRS	361 pounds of Halon 1301 were released at 210-S as a result of moisture in the room which caused the detectors to activate.	$0.00
Fire/Smoke (Building)	PNR / BAPL	Sitewide fire alarm 337 sounded for the E-Building. The Halon fire suppression system, which held 310 pounds of Halon 1301, discharged into the plotter room area of the building in response to the alarm. The cause of the discharge was determined to be the mechanical failure of a bearing on an HVAC blower that seized and caused the drive belt to smoke. The off-site mutual aid fire department responded to the scene. The area was checked and no signs of fire were found and the area was ventilated. The HVAC unit was repaired and the Halon suppression system was refilled using the on site reserve supply of Halon 1301.	$0.00
Leaks, Spills, Releases	SNR / KAPL	Inadvertent activation of a carbon dioxide suppression system. In a Knolls Site Computer Room and underfloor (local application) system discharged. There was no fire. Follow-up testing concluded system design and operability parameters were not the contributor to the failure, however, based on the age of the microprocessor based fire alarm panel, a new agent release panel was installed and the system restored to service.	$0.00

[11] The above figure does not consider system leakage in a stable condition.

Table 6: **Non Water Based System Actuations**			
LOSS TYPE	**LOCATION**	**DESCRIPTION**	**DOLLAR LOSS**
Leaks, Spills, Releases	AL / SNL	SNLA-Event No.52: Personnel reported that a Halon system for a wet bench had malfunctioned and discharged. The wet bench is within a closed room and access is currently not allowed. This particular Halon system is not tied to the Bldg. fire alarm system.	$0.00
Leaks, Spills, Releases	SPR / SPR	There was an inadvertent Halon dump at Bayou Choctaw site from an electrical short in the Halon control panel. Loss of 1194 pounds of Halon of which was not replaced. (Non-Routine Spill/Non Compliance Report BC07300201)	$0.00

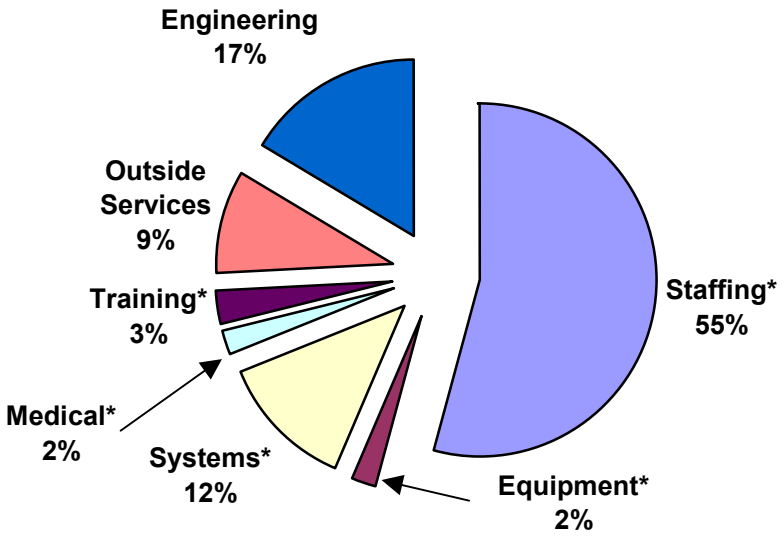
RECURRING FIRE PROTECTION PROGRAM COSTS

Yearly or recurring fire protection costs for CY 2002 reached $138,668,777. for the DOE Complex. On a ratio of cost to CAIRS property value (recurring cost rate) , the DOE spent approximately 14.04 cents per $100 property value for recurring fire protection activities, 0.65 cents less then the previous year.

Figure 11 shows the CY 2002 recurring cost distribution by activity. Figure 12 lists the recurring cost rate by DOE field organizations. It should be noted that not all recurring cost activities were consistently reported, such as outside contracts and maintenance activities. Additionally, sites that did not report recurring costs this calendar year (primarily ORNL, ETTP, MEMP) had their costs carried forward from the past reporting period to maintain the validity of the statistic. Had these costs been omitted from the database, the DOE would have experienced a decrease in the recurring cost amount by approximately $10,000,000.

Figure 11

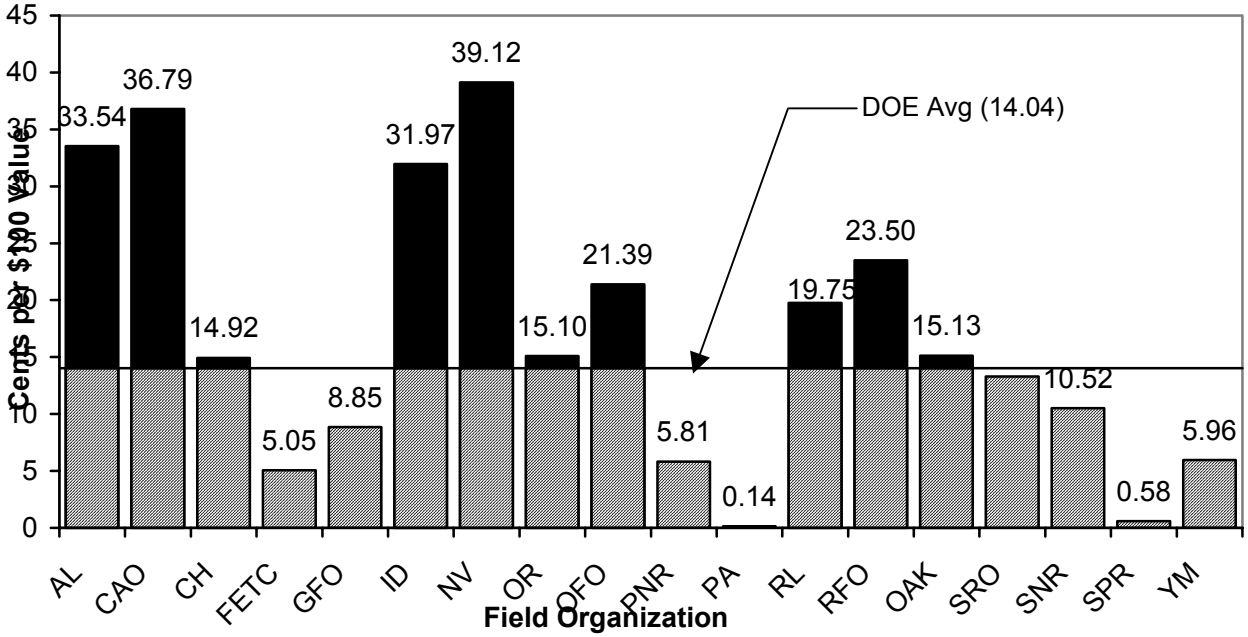
Recurring Fire Protection Cost Distribution



* Fire Department Activities

Figure 12

Cost Rate by Operations Office



FIRE DEPARTMENT ACTIVITIES

a. Number of Responses: The following is a summary of fire department responses for CY 2002.These numbers represent data sent in from approximately 19 of the 22 fire departments stationed at DOE sites.

1.	Fire	533
2.	Hazardous Materials	470
3.	Other Emergency	3,236
4.	Other Non-Emergency	7,474
5.	Medical	2,074
	Total	13,787

Comparing this data to the actual type of response is difficult since sites do not report incident responses in a consistent fashion. The Office of Environment, Safety and Health is examining the use of a standard reporting format which complies with the National Fire Protection Association's Guide 901,"Uniform Coding for Fire Protection" that could be linked to other DOE incident reporting programs for an accurate and cost effective approach to data collection in DOE. Other options, such as folding DOE's fire data collection into State or National programs such as the National Fire Incident Reporting System, are also being considered.

b.Major Equipment Purchases:

Table 7: **Major Equipment Purchases**		
LOCATION	**DESCRIPTION**	**AMOUNT**
CH / BNL	Front-end workstations for the BNL Site Fire Alarm System	$1,200,000.00
ID / INEEL	Narrowband radio upgrade	$128,300.00
SRO / SRS	Wheeled Coach Ambulance	$112,470.80
OAK / LLNL	Type III Wildland Fire Engine	$100,000.00
CH / BNL	Command Post vehicle	$90,000.00
OR / Y-12	Ambulance	$78,000.00
CH / FNAL	Ambulance	$62,501.00
CH / FNAL	Ambulance and Thermal Imiging Camera	$59,293.00
NV / NTS	(2) thermal imaging cameras	$40,000.00
NV / NTS	Firehouse reporting software and PC upgrades	$20,000.00
CH / FNAL	Thermal Imiging Camera	$15,150.00
AL / KCP	Thermal Imager	$14,000.00
RFO / RF	Helmets (56)	$13,304.00
RFO / RF	Turnout Gear	$12,640.00
NV / NTS	(1) Amikus Rescue tool	$12,000.00
NV / NTS	(2) ATVs with trailers	$11,000.00
PNR / BAPL	PPE	$3,676.00
PNR / BAPL	Foam Concentrate	$3,415.00
PNR / BAPL	Fire Hose Pressure Tester	$2,248.00
SRO / SRS	18 Trellchem haz-mat suits	$37,000.00

c. Notable Response Descriptions, such as mutual aid responses, that are not already included in this Report:

Table 8: **Notable Responses**		
LOCATION	**DATE**	**DESCRIPTION**
ID / INEEL	04/29/02	Escaped prescribed fire being conducted off site. Fire was less than an acre. This fire was off-sight
ID / INEEL	04/29/02	Escaped prescribed fire being conducted off site. Fire was less than an acre. This fire was off-sight
ID / INEEL	08/13/02	Wildland fire caused by children playing with matches. Fire size was approximately 1/2 acre. Fire event was off site
CH / BNL	01/15/2002	Incident Report Number: 020015 Mutual Aid To: Ridge Fire Department for a motor vehicle accident at Longwood Road and the William Floyd Parkway. BNL transported one patient to a local hospital.
CH / BNL	02/05/2002	Incident Report Number: 020030 Mutual Aid To: Ridge for a two-car motor vehicle accident at the Main Gate to BNL's property. Heavy rescue support provided with transport of one patient to the hospital in BNL's ambulance.
CH / BNL	03/06/200	Incident Report Number: 020051 Mutual Aid To: Ridge Fire Department for an ambulance

Table 8: **Notable Responses**		
LOCATION	**DATE**	**DESCRIPTION**
	2	to transport of patient as the result of a house fire
CH / BNL	03/13/2002	Incident Report Number: 020062 Mutual Aid To: Ridge Fire Department for one ambulance and heavy rescue to a car accident on Route 25.
CH / BNL	06/26/2002	Incident Report Number: 020174 Mutual Aid To: Ridge Fire Department for heavy rescue and an ambulance to transport one patient from a motor vehicle accident on the William Floyd Parkway by the Long Island Expressway.
CH / BNL	07/03/2002	Incident Report Number: 020189 Mutual Aid To: Manorville Fire Department for a brush fire on North Street west of Weeks Road.
CH / BNL	07/13/2002	Incident Report Number: 020199 Mutual Aid To: Mutual Aid to Ridge Fire Department for an ambulance. Transported one patient from the car accident at William Floyd Parkway and Longwood Road to a local hospital.
CH / BNL	07/18/2002	Incident Report Number: 020209 Mutual Aid To: Ridge Fire Department for a brush fire at Longwood Road. Engine 3 responded.
CH / BNL	07/23/2002	Incident Report Number: 020216 Mutual Aid To: To Ridge Fire Department for an ambulance to transport one patient from a motor vehicle accident to a local hospital.
CH / BNL	08/09/2002	Incident Report Number: 020247 Mutual Aid To: To Ridge Fire Department for an ambulance to transport one patient to a local hospital.
CH / BNL	08/14/2002	Incident Report Number: 020251 Mutual Aid To: To Ridge Fire Department for an ambulance to transport one patient from a motor vehicle accident at the main gate to a local hospital.
SPR / SPR	09/14/02	West Hackberry on-duty ERT responded to an off site natural gas leak. ERT members setup hot-warm-cold zones inside site fenced area and monitored area until leak was isolated. (Occurrence Report None)
SPR / SPR	11/26/02	Bryan Mound on-duty ERT responded to a small on site crude oil spill. Leak was isolated while ERT members initiated cleanup.(Occurrence Report BM-2002-0006)
SPR / SPR	11/10/02	Bayou Choctaw on-duty ERT responded to a small on site brine leak. Leak was isolated while ERT members initiated cleanup.(Occurrence Report BC-2002-0001)
PNR / BAPL	02/26/02	The Bettis Volunteer Fire Department (BVFD) responded to a request for mutual aid from the City of McKeesport for assistance at the scene of a working house fire. Engine -2 responded with 6 fire fighters and assisted the McKeesport Fire Department with fire suppression and overhaul operations.
PNR / BAPL	09/11/02	The smell of natural gas was reported in the L-Building. The building was evacuated and the BVFD responded to the scene for stand-by while the area was checked for hazards. The problem was traced to a small natural gas line valve with a leaking valve stem.

CONCLUSIONS

DOE experienced no fatalities or major injuries from fire in CY 2002. The Annual Summary reporting process has recently been automated to streamline data collection and provide a more through review of DOE Reporting Element activities. It is now possible to view all Annual Summary Reporting Element responses since 1991 at the Site, Operations, Lead Program Secretarial Office and Headquarters levels, as well as reference other DOE reporting activities (CAIRS and ORPS) To obtain a copy of the Annual Summary Application please contact Jim Bisker in the Office of Nuclear and Facility Safety Policy (EH-53) at 301.903.6542 or jim.Bisker@hq.doe.gov.